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Parametric Effects on the Flow Performance of Single Disk Viscous Micropump. A. AL-SALAYMEH, M.I. KILANI, University of Jordan, A.T. AL-HALHOULI, S. BÜTTGENBACH, TU-Braunschweig — The effect of design parameters such as radius ratio and channel aspect ratio on the flow performance of a newly introduced single disk viscous micropump has been investigated. A number of 3D numerical models for the single disk micropump have been built and analyzed at different boundary conditions using finite volume method. To express the effect of the pressure difference and boundary velocity on the flow performance at various design parameters, drag and pressure shape factors for the radius and aspect ratios have been defined and built numerically and compared with approximate 2D analytical solution using Navier-Stokes equation estimating for the flow rates. The effect of aspect ratio at moving and stationary walls conditions has been also analytically and numerically investigated. The obtained results showed that the error in estimating the drag shape factors at different radius and aspect ratios are less than 1.0%. However, the error in estimating the pressure shape factor exceeds 10% for and 3% at. Numerical results were found to be best fitted with the analytical solution. Also, it has been found numerically that the flow rate varies linearly with both the pressure difference and boundary velocity for wide range of studied parameters, which supports the validity of the linear lubrication model for this problem for the full range of radius and aspect ratios studied.

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